

International Ridge-Crest Research: **Indian Ridge**: Dyment *et al.* continued...

Anomaly Magnetic High (CAMH) and will be analyzed together with the deep tow and submersible magnetic anomalies. The tremendous along-axis variations of the equivalent magnetization are associated with the faint, second-order, segmentation depicted by the bathymetry. Higher equivalent magnetization values correspond to segment ends and lower values to segment centres, as observed on other spreading centres.

Advantage was taken from transit periods to acquire bathymetry, imagery, magnetics and gravity, which will complete the data set acquired during the MAGOFOND 2 cruise. A small ridge was discovered northeast of Rodrigues Island during the first transit. This ridge trends N70°E, extends more than 36 km and towers 2000 m over the nearby seafloor (~ 3200 m deep). These characteristics make it very similar to the Three Magi and Gasitao Ridges (Dyment *et al.*, 1999) and suggest a common origin for these features.

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Exploration of the Carlsberg Ridge

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Surveys to explore the slow to medium spreading Carlsberg Ridge, which acts as a plate boundary between the Indian and African plates in the northern Arabian Sea, have been ongoing since 1996. A ~ 100 km long section of the Carlsberg ridge was surveyed with multi-beam bathymetry, gravity and magnetics and seabed sampling during the cruise on board *ORV Sagar Kanya* (SK-114) in June-July 1996. In July-August 2000, a cruise (SK-154) was undertaken to augment the earlier data, and an area of ~ 17,000 km² was covered with the multi-beam swath bathymetry (MBS). Concurrent with MBS data, gravity and magnetics

were acquired. Geological sampling was carried out at selected locations based on MBS data. The recent exploration was carried out in two blocks separated by about 70 nautical miles.

Major transform faults or transform zones are absent in the region surveyed. However, the ridge axis showed a continuous and gradual shift in the trend. Along the axial valley, occurrence of axial lows of about 4700 m at regular intervals is a unique feature of Block 1 (Fig.1). These axial valley lows appear to influence the changes in the ridge axis trend. Another supportive evidence for this possible

interpretation is the presence of the topographic highs along the ridge flanks closer to these axial lows. Near the central part, gradual merging of the ridge axis into the ridge flanks and the absence of linear steep valley walls with a distinct topographic signature observed.

In the second block of the survey (Fig. 2), the axial valley was comparatively wider and showed gradual shallowing up of the axial valley floor to about 3600 m, from ~ 4000 m in Block 1. The contour map of Block 2, shows a non-transform ridge axis discontinuity which is flanked on the northern side by a topographic high

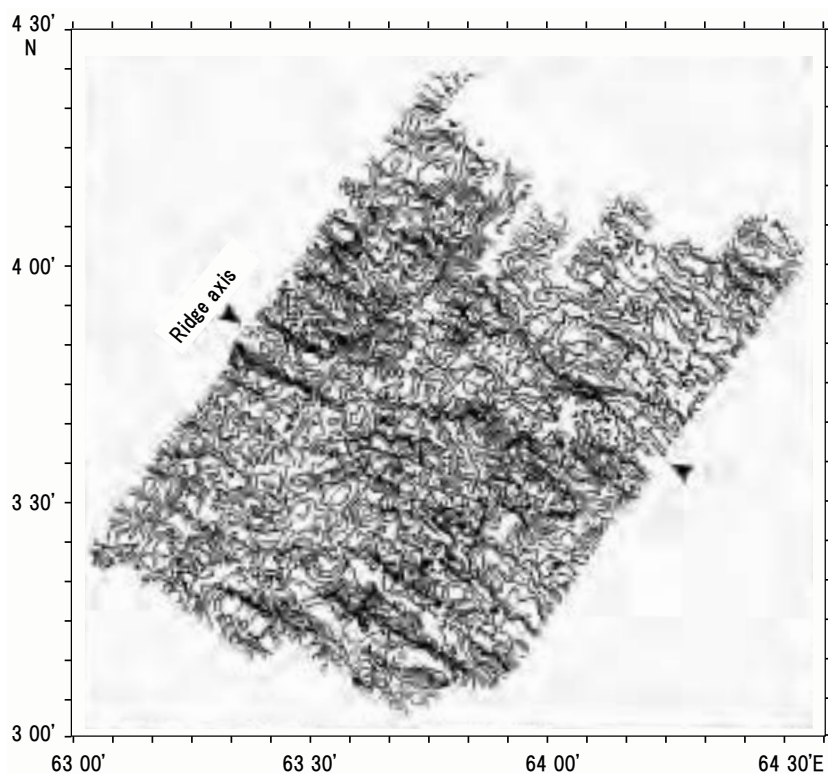


Figure 1. Carlsberg Ridge - Block 1

rising from 3600 m to 1800 m. A general observation is that adjacent to the axial shift, at least on one side of the ridge flank, there are topographic highs reaching water depths of ~ 2000 m.


Geological sampling locations were selected based on the online swath bathymetry records and post-processed (on-board) MBS data. The online MBS data was useful in selecting locations for dredge as well as coring within the axial valley and on the flanks. Sediment cores, collected within the axial valley ~ 1.27 m & 2.7 m long indicated that volcanism was very sparse and/ or occasional. Two sediment cores were recovered from the topographical deeps of ~4600 m from the ridge flanks and average core length was about 5.5 m.

Dredge operations carried out using chain-bag dredge at four locations brought up a variety of rock samples. In general, the dredged basalts were altered; at one location fresh basalts with a thick chilled glass margin were recovered. The glass exhibited conchoidal fracture and broke easily indicating a fragile nature. One of the dredge hauls recovered from an axial high, close to the axial

valley, was full of serpentinites with a minor percentage of peridotites (Iherzolites/harzburgite). The serpentinites showed varied macroscopic characters from fibrous to blocky type with different shades of green. Some serpentinites were associated with pyroxenes, which were altered and show twinkling when viewed against the light.

With the two expeditions carried out so far, a continuous coverage of ~ 150 nautical miles of the axial and adjacent flank area of the Carlsberg Ridge is mapped. This is the first time such a long axial area of the Carlsberg Ridge has been mapped with multi-beam bathymetry and other geophysical parameters.

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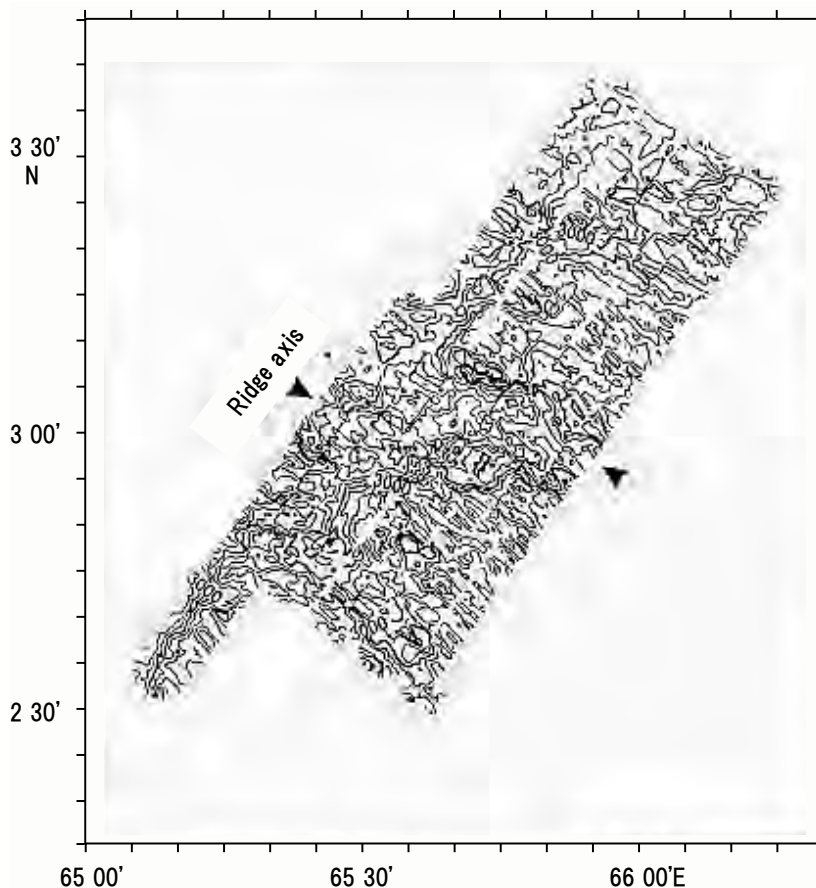


Figure 2. Carlsberg Ridge - Block 2